

Amendments to the Specification:

Please make the following amendment to the paragraph starting on page 35, line 17. This amendment is made solely to clarify the subject matter.

BI (5) The impedance-matched pulse ~~period~~ width is to be less than 75 nanoseconds, but preferably less than 30 nanoseconds, and most preferably less than 15 nanoseconds, provided that the rise time can be achieved on the order of 5 nanoseconds.

Please make the following amendments to the paragraph starting on page 11, line 6. The following contains all of the amendments present in the applicant's previous response, with the exception that the formula " O^1D " was erroneously amended in the previous response; it is correct.

In a preferred embodiment, the present invention's method of meeting the aforementioned criteria uses: ultrahigh E/N (initially greater than approximately 180 Townsends)[[;]] and ultrashort (τ is approximately 5-15 nanoseconds) pulses at a rep rate sufficient to maintain an average electron number density of approximately 10^{13} to approximately 10^{14} electrons/cm³ during the pump period (typically approximately 20 KHz to approximately 40 KHz), while maintaining a constant DC pump field (or magnetically induced square wave potential) ~~at the required pump value of E/N is~~ at a potential required to produce an E/N value of approximately 10 Td. In most systems of the present invention, ultrashort pulses of less than approximately 75 nanoseconds are desired while preferably pulses are less than approximately 25 nanoseconds and most preferably, pulses are less than approximately 15 nanoseconds. Through experimentation and investigation of a large number of generator configurations, preferred configurations comprise an integral electrical excitation generator and a heat exchanger. These configurations allow isothermal heat addition; i.e., rapid removal of waste heat is in equilibrium with internal rate of heat production. It is noted that the applied pump potential (E/N is approximately 10 Td) falls far below the electric field required to maintain ionization[[;]]; therefore, a continuous sequence of ultra high voltage (E/N initially greater than or equal to approximately 180 Td), high repetition rate (e.g., 20,000 to 40,000 pps or more) pulses are applied to renew the ionization lost while the field is being sustained at only 10 Td (under fully developed equilibrium conditions, for example), ~~and at high repetition rates e.g., 20,000 to 40,000 pps or more), for example,~~ Note that the residual ionization can reduce ~~thh~~ the E/N level needed to renew ionization from levels of approximately 180 Td to levels less than approximately 180 Td, in some instances, for example, down to levels of approximately 100 Td or less[[;]]. These ionization pulses must be arrested to limit each pulse to less than a few tens of nanoseconds duration. Any ionization pulses of order E/N greater than or equal to approximately 100 Td to ~~approximately~~ approximately 180 Td (depending on the initial ionization number density) lasting longer than approximately 75 nanoseconds would lead to arc breakdown. Furthermore, ionization pulses lasting longer than a few tens of nanoseconds generates

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O¹D at a concentration which tends toward becoming deleterious. Of course the invention is not limited to the parameters set forth in this particular embodiment, for example, but not limited to, E/N is not limited to values given, the pulse length is not limited to the values given, and the electron number density is not limited to the values given. Furthermore, the invention is not limited to oxygen iodine lasers, because the pulse circuits and generators of the present invention have other uses as well. Depending on the particular use and configuration of any particular embodiment, E/N values of 150 Td are within the scope of the present invention for over-volting, as well as, for example, but not limited to, electron number density values from 10^{12} to 10^{15} .

Please make the following amendments to the paragraph starting on page 17, line 24. The following contains all of the amendments present in the applicant's previous response, with the exception that the phrase "(fraction $O_2^1\Delta/O_2^3\Sigma$)" was unnecessarily amended in the previous response; it is correct.

B³ The generation of $O_2^1\Delta$, along with other competing processes, has been theoretically calculated along the length of the tubes subject to excitation as described above. The graph of the calculation, Figure 7, shows that under these conditions the tube will generate its maximum yield of $O_2^1\Delta$ if its length is approximately 42 cm. Beyond approximately 42 cm, the "pooling" process causes the creation of $O_2^1\Sigma$ to dominate. At 42 cm, the theoretical yield Y (fraction $O_2^1\Delta/O_2^3\Sigma$) is approximately 29% — a value sufficient to produce superb laser performance. Under differing conditions the optimal length optionally differs;[[.]] for example, but not limited to, lengths up to and beyond approximately one meter in length are within the scope of the present invention.